

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1 1-11 (Canceled).

1 12. (Original Claim) A computer-readable storage medium storing
2 instructions that when executed by a computer cause the computer to perform a
3 method for using a computer system to solve a global optimization problem
4 specified by a function f and a set of equality constraints, the method comprising:
5 receiving a representation of the function f and the set of equality
6 constraints $q_i(\mathbf{x}) = 0$ ($i=1, \dots, r$) at the computer system, wherein f is a scalar
7 function of a vector $\mathbf{x} = (x_1, x_2, x_3, \dots, x_n)$;
8 storing the representation in a memory within the computer system;
9 performing an interval equality constrained global optimization process to
10 compute guaranteed bounds on a globally minimum value of the function $f(\mathbf{x})$
11 subject to the set of equality constraints;
12 wherein performing the interval equality constrained global optimization
13 process involves,
14 applying term consistency to a set of relations associated
15 with the interval equality constrained global optimization problem
16 over a subbox \mathbf{X} , and excluding any portion of the subbox \mathbf{X} that
17 violates any of these relations,
18 applying box consistency to the set of relations associated
19 with the interval equality constrained global optimization problem

20 over the subbox \mathbf{X} , and excluding any portion of the subbox \mathbf{X} that
21 violates any of the relations, and
22 performing an interval Newton step for the interval
23 equality constrained global optimization problem over the subbox
24 \mathbf{X} .

1 13. (Original Claim) The computer-readable storage medium of claim 12,
2 wherein applying term consistency to the set of relations involves applying term
3 consistency to the set of equality constraints $q_i(\mathbf{x}) = 0$ ($i=1, \dots, r$) over the subbox
4 \mathbf{X} .

1 14. (Original Claim) The computer-readable storage medium of claim 12,
2 wherein applying box consistency to the set of relations involves applying box
3 consistency to the set of equality constraints $q_i(\mathbf{x}) = 0$ ($i=1, \dots, r$) over the subbox
4 \mathbf{X} .

1 15. (Original Claim) The computer-readable storage medium of claim 12,
2 wherein performing the interval equality constrained global optimization
3 process involves,
4 keeping track of a least upper bound f_bar of the function
5 $f(\mathbf{x})$, and
6 removing from consideration any subbox for which
7 $\inf(f(\mathbf{X})) > f_bar$;
8 wherein applying term consistency to the set of relations involves applying
9 term consistency to the f_bar inequality $f(\mathbf{x}) \leq f_bar$ over the subbox \mathbf{X} .

1 16. (Original Claim) The computer-readable storage medium of claim 15,
2 wherein applying box consistency to the set of relations involves applying box
3 consistency to the f_bar inequality $f(\mathbf{x}) \leq f_bar$ over the subbox \mathbf{X} .

1 17. (Original Claim) The computer-readable storage medium of claim 12,
2 wherein performing the interval equality constrained global optimization
3 process involves preconditioning the set of equality constraints through
4 multiplication by an approximate inverse matrix \mathbf{B} to produce a set of
5 preconditioned equality constraints; and
6 wherein applying term consistency to the set of relations involves applying
7 term consistency to the set of preconditioned equality constraints over the subbox
8 \mathbf{X} .

1 18. (Original Claim) The computer-readable storage medium of claim 17,
2 wherein applying box consistency to the set of relations involves applying box
3 consistency to the set of preconditioned equality constraints over the subbox \mathbf{X} .

1 19. (Original Claim) The computer-readable storage medium of claim 12,
2 wherein performing the interval Newton step involves performing the interval
3 Newton step on the John conditions.

1 20. (Original Claim) The computer-readable storage medium of claim 12,
2 wherein prior to performing the interval Newton step on the John conditions, the
3 method further comprises performing a linearization test to determine whether to
4 perform the Newton step on the John conditions.

1 21. (Original Claim) The computer-readable storage medium of claim 12,
2 wherein performing the interval equality constrained global optimization process
3 involves:
4 evaluating a first termination condition;
5 wherein the first termination condition is TRUE if the width of the subbox
6 **X** is less than a pre-specified value, ε_X , and the width of the $f(\mathbf{X})$ is less than a pre-
7 specified value, ε_F ; and
8 if the first termination condition is TRUE, terminating further splitting of
9 the subbox **X**.

1 22. (Original Claim) The computer-readable storage medium of claim 12,
2 wherein performing the interval Newton step involves:
3 computing $\mathbf{J}(\mathbf{x}, \mathbf{X})$, wherein $\mathbf{J}(\mathbf{x}, \mathbf{X})$ is the Jacobian of the function **f**
4 evaluated as a function of **x** over the subbox **X**; and
5 determining if $\mathbf{J}(\mathbf{x}, \mathbf{X})$ is regular as a byproduct of solving for the subbox **Y**
6 that contains values of **y** that satisfy $\mathbf{M}(\mathbf{x}, \mathbf{X})(\mathbf{y} - \mathbf{x}) = \mathbf{r}(\mathbf{x})$, where
7 $\mathbf{M}(\mathbf{x}, \mathbf{X}) = \mathbf{B}\mathbf{J}(\mathbf{x}, \mathbf{X})$, $\mathbf{r}(\mathbf{x}) = -\mathbf{B}\mathbf{f}(\mathbf{x})$, and **B** is an approximate inverse of the center of
8 $\mathbf{J}(\mathbf{x}, \mathbf{X})$.

1 23-33 (Canceled).